

FRA Form 4

BOILER SPECIFICATION CARD

Locomotive No. _____; Boiler No. _____; Date built _____

Boiler built by: _____

Owned by: _____

Operated by: _____

Type of boiler: _____; Dome, where located: _____

BOILER SURVEY DATA

Where **condition** is called for, use: **New** - New material at the time of the boiler survey; **Good** - Little or no wear and/or corrosion; **Fair** - Obvious wear and/or corrosion.

Boiler Shell Sheets**Material:**

	Type of Material (wrought iron, carbon steel, or alloy steel)	Carbon Content	Condition
1st course (front)	_____	_____	_____
2nd course	_____	_____	_____
3rd course	_____	_____	_____
Rivets	_____	n/a	n/a

Documentation of how material was determined shall be attached to this form.

Measurements:

		At Seam	Thinnest		
Front flue sheet,	thickness	n/a	_____		
1st course,	thickness	_____,	_____,	ID _____,	ID _____
2nd course,	thickness	_____,	_____,	ID _____,	ID _____
3rd course,	thickness	_____,	_____,	ID _____,	ID _____

When courses are not cylindrical give ID at each end

Is boiler shell circular at all points? _____

If shell is flattened, state location and amount _____

Are all flattened areas of shell stayed adequately for the pressure allowed by this form? _____

Water Space at Mud Ring: Sides _____, Front _____, Back _____

Width of water space at sides of fire box measured at center line of boiler: Front _____, Back _____

Firebox and Wrapper Sheets**Firebox sheets:**

	Thickness	Material	Condition
Rear flue sheet	_____	_____	_____
Crown	_____	_____	_____
Sides	_____	_____	_____
Door	_____	_____	_____
Combustion chamber	_____	_____	_____
Inside throat	_____	_____	_____

Wrapper sheets:

Throat	_____	_____	_____
Back head	_____	_____	_____
Roof	_____	_____	_____
Sides	_____	_____	_____

Steam Dome

Dome is made of _____ pieces (not including seam welts, if any), Top opening diameter _____
Middle cylindrical portion - ID _____, Opening in boiler shell, longitudinally - _____

Dome sheets:	Thickness	Material	Condition
Base	_____	_____	_____
Middle cylindrical portion	_____	_____	_____
Top	_____	_____	_____
Lid	_____	_____	_____
Boiler shell liner for steam dome opening:	_____	_____	_____
Is liner part of longitudinal seam?	_____		

Arch Tubes, Flues, Circulators, Thermic Siphons, Water Bar Tubes, Superheaters, and Dry Pipe

Arch tubes: OD _____, wall thickness _____; number _____; condition _____

Flues:

OD _____, wall thickness _____, length _____; number _____; condition _____
OD _____, wall thickness _____, length _____; number _____; condition _____
OD _____, wall thickness _____, length _____; number _____; condition _____

Circulators: OD _____, wall thickness _____; number _____; condition _____

Thermic siphons: number _____; plate thickness _____; condition _____
neck OD _____, neck thickness _____; condition _____

Water bar tubes: OD _____, wall thickness _____

Superheater units directly connected to boiler with no intervening valve:

Type _____, Tube OD _____, wall thickness _____; number _____; condition _____

Dry pipe subject to pressure:

OD _____, wall thickness _____, material _____; condition _____

Stay Bolts, Crown Bar Rivets, and Braces

Stay bolts:

Smallest crown stay diameter _____, avg. spacing _____ X _____; condition _____
Smallest stay bolt diameter _____, avg. spacing _____ X _____; condition _____
Smallest combustion chamber stay bolt dia. _____, avg. spacing _____ X _____; condition _____

Measurement at smallest diameter

Crown bar bolts & rivets:

Roof sheet rivets, smallest dia. _____, ave. spacing _____ X _____; condition _____
Roof sheet bolts, smallest dia. _____, ave. spacing _____ X _____; condition _____
Crown sheet rivets, smallest dia. _____, ave. spacing _____ X _____; condition _____
Crown sheet bolts, smallest dia. _____, ave. spacing _____ X _____; condition _____

Braces:

Total Cross Sectional Area of Braces

	Number	Total Area Stayed	Actual	Equivalent Direct Stay
Backhead	_____	_____	_____	_____
Throat sheet	_____	_____	_____	_____
Front tube sheet	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Safety Valves, Heating Surface, and Grate Area

Safety valves:	Total number of safety valves on locomotive_____	
Valve Size	Manufacturer	No. valves of this size and manufacture
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Heating Surface:

Heating surface, as part of a circulating system in contact on one side with water or wet steam being heated and on the other side with gas or refractory being cooled, shall be measured on the side receiving heat.

Firebox and Combustion Chamber	_____	square feet
Flue Sheets (less flue ID areas)	_____	square feet
Flues	_____	square feet
Circulators	_____	square feet
Arch Tubes	_____	square feet
Thermic Siphons	_____	square feet
Water Bar Tubes	_____	square feet
Superheaters (front end throttle only)	_____	square feet
Other	_____	square feet
Total Heating Surface	_____	square feet

Grate area: _____ square feet

Water Level Indicators, Fusible Plugs, and Low Water Alarms

Height of lowest reading of gauge glasses above crown sheet: _____

Height of lowest reading of gauge cocks above crown sheet: _____

Is boiler equipped with fusible plug(s)? _____, number _____

Is boiler equipped with low water alarm(s)? _____, number _____

Calculations

Staybolt stresses:

Stay bolt under greatest load, maximum stress _____ psi
 Location _____

Crown stay, crown bar rivet, or crown bar bolt under greatest load, max. stress _____ psi
 Location _____

Combustion chamber stay bolt under greatest load, maximum stress _____ psi
 Location _____

Braces:

Round or rectangular brace under greatest load, maximum stress _____ psi
 Location _____

Gusset brace under greatest load, maximum stress _____ psi
 Location _____

Shearing stress on rivets:

Greatest shear stress on rivets in longitudinal seam _____ psi
 Location (course #) _____ ; Seam Efficiency _____

Boiler shell plate tension:

Greatest tension on net section of plate in longitudinal seam _____ psi
 Location (course #) _____ ; Seam Efficiency _____

Boiler plate and components, minimum thickness required @ tensile strength:

Front tube sheet	_____ @ _____	Rear flue sheet	_____ @ _____
1st course at seam	_____ @ _____	1st course not at seam	_____ @ _____
2nd course at seam	_____ @ _____	2nd course not at seam	_____ @ _____
3rd course at seam	_____ @ _____	3rd course not at seam	_____ @ _____
Roof sheet	_____ @ _____	Crown sheet	_____ @ _____
Side wrapper sheets	_____ @ _____	Firebox side sheets	_____ @ _____
Back head	_____ @ _____	Door sheet	_____ @ _____
Throat sheet	_____ @ _____	Inside throat sheet	_____ @ _____
Combustion chamber	_____ @ _____	Dome, top	_____ @ _____
Dome, middle	_____ @ _____	Dome, base	_____ @ _____
Arch tubes	_____ @ _____	Dome, lid	_____ @ _____
Water bar tubes	_____ @ _____	Thermic siphons	_____ @ _____
Dry pipe	_____ @ _____	Circulators	_____ @ _____

- Notes. 1. If tensile strength used is greater than 50,000 psi for steel or greater than 45,000 psi for wrought iron, supporting documentation must be furnished.
2. Any shell dimension less than 1/4" in thickness may not be adequate for support of or by other structures, particularly where threads or staybolts are concerned. Applicable codes should be consulted.

Boiler Steam Generating Capacity: _____ pounds per hour

The following may be used as a guide for estimating steaming capacity:

Pounds of Steam Per Hour Per Square Foot of Heating Surface:

Hand fired	8 lbs. per hr.
Stoker fired	10 lbs. per hr.
Oil, gas or pulverized fuel fired	14 lbs. per hr.

Record of Alterations

Description of Alteration

Date of Alteration

